Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	**)**	
	)	
Inquiry Regarding Carrier Current	**)**	**ET Docket No. 03-104**
Systems, Including Broadband Over	**)**	
Power Line Systems	**)**	

To: The Commission

REPLY COMMENTS OF
James A. Sanford, PE

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SUMMARY

I, James A. Sanford, PE, an Amateur Radio operator, strongly support the American Radio Relay League ("ARRL") in its opposition to the Broadband Power Line ("BPL") initiative currently before the Commission in this proceeding.

As the ARRL demonstrates in its detailed technical study, BPL will have a massive, harmful radio frequency interference impact on licensed Amateur Radio across the Nation. Worse, BPL adversely impact emergency communications of the Department of Homeland Security(DHS) and the Federal Emergency Management Agency(FEMA). Short wave radio listeners will also be adversely impacted. The physics of power lines and transmission lines, and the radio frequencies intended for BPL use GUARANTEE an increase in the radio ambient noise level so that weak signals will no longer be receivable where BPL is deployed. This will profoundly undermine the ability of Amateur Radio operators to serve as a national emergency communications resource in support of FEMA and DHS if commercial communications facilities are damaged, overwhelmed, or destroyed by a natural occurrence or terrorist attack. European investigators have substantiated ARRL's conclusions.

As the ARRL shows, Amateur Radio and other licensed stations will also unavoidably cause interference to BPL receivers. Wide deployment of BPL will lead to consumer dissatisfaction with reception of data simply due to the fundamental laws of physics involved. Amateur Radio operators will face a massive public relations problem, and the Commission and Congress will be overwhelmed with calls for action – all due to a fundamentally flawed deployment.

I URGE the Commission to terminate this proceeding and reject BPL as a technology for use in the HF and low VHF spectrum.

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I. INTRODUCTION

I respectfully submit my reply comments in response to comments filed in the Commission's *Notice of Inquiry* ("NOI") in the above-captioned proceeding. The NOI requested information on the current state of Broadband Power Line ("BPL") technology and the impact its implementation would have on other services.

I am an Amateur Radio operator with 35 years experience and a licensed Professional Engineer. I just completed a 27-year career as a Naval officer where my Amateur Radio experience helped our Nation and allowed me to provide humanitarian service to our Sailors and their families. I am currently employed by a Defense contractor in support of the Naval Nuclear Propulsion Program. As discussed below, I support commentors such as the American Radio Relay League, Inc. ("ARRL") who urge the Commission to take no further

action toward permitting access or in-building BPL in the high-frequency ("HF") or very-high frequency ("VHF") bands. Any other outcome would severely undermine the public interest by critically weakening several vast national emergency communications resources.

I vigorously pursue Amateur Radio activities on the HF, VHF and microwave bands. I have investigated and developed low-cost solutions for Microwave and Satellite communications. I have advanced the state of the art by developing free software, which runs on low-cost hardware to automatically track low earth orbiting communications satellites. I have facilitated communications between school children and astronauts in MIR and the Space Shuttle. I have provided emergency communications services at times of national, regional or local need, ranging from the aftermath of Hurricane Hugo's devastation in South Carolina to crowd control during Apollo launches to the Moon. My wife, son, and I have provided thousands of man-hours of public service to our community by providing communications for events such as parades and high school marching band competitions. The city of Hampton, VA, which once attempted to outlaw all amateur antenna towers, now asks any event promoter if they've contacted our local club for support before authorizing the proposed event. This has all been done using sophisticated stations we have gone to great personal expense and effort to develop and assemble. In several decades of doing these things, it has become clear to me that Amateurs bring two important attributes to the emergency and community communications problems: a diverse set of communications hardware, and a TRAINED, PROFICIENT cadre of EFFICIENT COMMUNICATORS. Loss of this resource would be a national tragedy.

A key to success as a communicator is my ability to detect weak signals from other stations, and under such conditions receive critical streams of data. This is precisely the capability that would be required in the event of an emergency where commercial

communications facilities were disabled or destroyed. From this background and perspective, I now submit my detailed support for ARRL's submission, supplemented with further empirical information and observation.

II. I SUPPORT ARRL'S CONCLUSIONS REGARDING THE DANGER OF ACCESS AND IN-BUILDING BPL

In its comments, ARRL points out a variety of serious infirmities regarding BPL and the effects it would have on HF and VHF spectrum users, particularly in the Amateur Radio service. I agree that the Commission's Part 15 rules should be modified now in order to prevent interference to current and future users of the HF and low VHF, and to prevent consumers' reliance on BPL as an interference-free broadband delivery system. It is not, and never will be, interference-free, and once unleashed will essentially destroy the viability of many other licensed services. I also agree with ARRL that BPL's potential interference to multiple licensed communications services disqualifies access BPL as a potential future competitive broadband delivery system. In your own proceedings, the Commission recognized the potential for harmful interaction when it denied authorization of an amateur allocation in the VLF range, citing the ill-conceived use of power line communications for control of power generation equipment. BPL would only exacerbate this problem.

Further, I agree that BPL presents a huge potential source of general radio frequency ("RF") pollution, a concern based on the nature of the proposed service itself as well as the many years of experience with power companies' treatment of interference complaints. It is also true, as ARRL demonstrates, that BPL will face untold interference from all levels of Amateur Radio AND NATIONAL AGENCY transmissions at virtually every home expecting to use BPL as yet another broadband medium.

A. BPL's Interference Potential Disqualifies Access BPL as a Viable Service

In its comments, ARRL discusses a "severe interference potential from BPL in the bands between 2 and 80 MHz to Amateur Radio stations." I agree with the ARRL assertion that while BPL is permitted under present Part 15 regulations, BPL's interference potential disqualifies access BPL as a potential future competitive broadband delivery system. Further, I concur with the ARRL statement, "the interference potential from access BPL systems is as yet unrealized, as they are not yet deployed. BPL is a Pandora's Box of unprecedented proportions." Moreover, this concern applies equally to BPL's possible effect on all HF and VHF spectrum users, be they Amateur Radio service licensees or national emergency agencies, and it is frightening to contemplate. In your own proceedings, the Commission declined to authorize an amateur band at 60 meters, citing needs of Homeland Security and FEMA. BPL would interfere with these Nationally vital users more than amateurs.

B. BPL Poses a Grave Danger to Emergency Services Provided by Amateur Radio Operators

ARRL discusses the critically important use of HF and VHF Amateur Radio bands for disaster relief communications and for a series of other public safety communications functions. Immediately adjacent to amateur HF allocations are numerous allocations for governmental communications channels including those for the Federal Emergency Management Agency and various military and intelligence services. Other allocations in the HF range (and near bands allocated to the Amateur Radio service) authorize over-the-ocean HF frequencies for international airlines. An HF communication from any airliner in mid-ocean with a safety or security issue could be masked by wideband noise from BPL.

As mentioned above, amateurs often deal with weak signal communications situations, in the context of contests where critical operating skills are practiced but also in real-

life emergency situations. Any increase in the noise spread across any HF or VHF amateur bands would mask weaker signals, whether in a radio contest environment, from an aeronautical source or from a boater or a hiker in distress.

The Commission, in the enforcement of a "National Radio Quiet Zone," has demonstrated its sensitivity to the nature of and risks of RF pollution. BPL constitutes a serious example of electromagnetic pollution that would affect nearly every licensed Amateur Radio operator and every other HF and VHF spectrum user.

The typical Amateur Radio receiver is an exceptionally sensitive device, and that is necessary to receive signals in environments of marginal propagation or where the transmitting station is limited to very low power, such as in an emergency situation. BPL would be implemented on a widespread basis, causing interference to and receiving interference from Amateur Radio and other service in virtually every community in the United States. It should be evident that there is an incompatibility based on physics that does not allow BPL to coexist with other radio services in the HF and VHF spectrum. These concerns will be discussed in greater detail below.

C. The Power Industry Cannot Deal With Radio Frequency Interference Issues

In its comments, ARRL relates the on-going struggle the Amateur Radio Service has experienced for many years with terrestrial interference in the HF bands. I can corroborate, through the considerable personal experience, the ARRL's assertion that "a principal source of reported interference is above-ground power lines." The nation's power distribution system has systematic and pervasive maintenance challenges, typified at the local level by loose hardware and defective components. My experience is that power companies are reluctant and slow to address these interference problems. (Dominion Power in Virginia is a particular exception.)

The Commission's own Enforcement Division and Consumer Inquiries and Complaint Division is often called into action because power companies are so non-responsive to entreaties from Amateurs to cure obvious power line problems. The Commission's own records document this problem. BPL will only make these problems worse and more noticeable.

Many power companies have required and continue to require the intervention of the Commission before acting to resolve interference complaints. And this is the situation as it exists today. Based on the behavior of power companies today, it is not credible that these companies would address and resolve the onslaught of major interference complaints that would accompany implementation of any BPL system.

D. BPL Would Be Susceptible to Massive Interference from Existing Spectrum Users

In its comments, ARRL has pointed out that the Commission recently refused to grant an Amateur Radio allocation in the 136 kHz band. The Commission found that the power-line carrier ("PLC") signals in this band, by which power companies control their distribution equipment remotely, might be adversely affected by Amateur Radio signals, even those as weak as one-watt EIRP. Independent of the wisdom of this decision, it is unarguable that if BPL were to be authorized, hundreds of thousands of Commission-licensed Amateurs Radio operators, complying with all applicable Commission Rules and transmitting anywhere from 5 watts to 1,500 watts with antennas located within ten meters of medium-voltage ("MV") power lines would easily obliterate virtually all HF and VHF BPL signals. Other Federal licensed users would be in the same situation. This situation cannot be permitted to unfold, either for consumers who would face massive degradation of service, for Amateur Radio operators who would be unfairly blamed, or for the Commission that would face untold public and Congressional criticism for having created such an environment.

E. ARRL's Study Demonstrates that BPL Will Interfere With a Broad Range of Services

In its comments, ARRL has provided the Commission with an excellent study of what happens when MV power lines become antennas. One of the most telling and chilling results of the ARRL's study is shown in Figure 5 of their exhibit. It shows that at 5 MHz and above, power lines become efficient antennas, radiating the very BPL information they are intended only to conduct. Rather than just transporting data to end users, BPL becomes a ubiquitous array of broadband HF and VHF "transmitters attached to antennas." This behavior is no surprise, based on a study of the fundamental laws of physics. BPL attempts to use power lines as a balanced transmission line. To be effective, a balanced transmission line requires:

- two conductors in close proximity
- two IDENTICAL conductors
- no discontinuities in either conductor

It takes little effort to recognize that power lines meet NONE of these requirements. As a result, they WILL radiate, and they will receive. Therefore, they will both CAUSE interference to- and RECEIVE interference from- licensed users. The result will be severe impact to the utility of the HF spectrum for communications, and a legion of dissatisfied would-be internet users.

When the Commission authorized five amateur frequency channels in the 5.3-5.4 MHz range earlier this month, it cooperated with the National Telecommunications and Information Administration ("NTIA") to avoid interference from other users of the nearby spectrum. It was for this reason that only five fixed frequencies with a maximum ERP of 50 watts were authorized. ARRL has clearly demonstrated that at 5 MHz power lines really do start becoming efficient radiators. That efficiency increases with frequency, so all users of the spectrum, including FEMA and DHS, would be subjected to interference and/or noise level

increases in their authorized bands, including NTIA-licensed operators. I strongly recommend that the Commission consider carefully and give great weight to the technical studies provided by ARRL in this proceeding.

F. The American Consumer Is Unaware of What BPL Portends

The potential for interference to and from BPL is enormous, as the Commission has already recognized. As ARRL noted, an Amateur Radio station operating at 1500 watts and using a 3-element parasitic Yagi antenna would produce a peak field strength 100 feet away in the main antenna lobe of approximately 30 V/m. Most industry standards for immunity of consumer-grade electronics require that the equipment be non-responsive to fields of approximately 3 V/m. However, there is nothing in the record to suggest that BPL will not operate in excess of this immunity threshold, particularly in view of the ability of power lines to act as exceedingly efficient (and even directive) antenna arrays.

Thus, a significant concern for the Commission should be the extent to which BPL would adversely affect the operation of a broad range of unlicensed RF devices and services, either by causing or receiving interference to or from those services. Amateur Radio operators, as licensed and responsible users of the spectrum, would instantly be identified as the source of interference to BPL operations, a situation that would be at best untenable and ultimately disserving of the public interest. Amateur Radio operators would be blamed for interference resulting from other licensed users, inundating the Commission with complaints. Eventually, the other licensed users would be impeded in their use of the HF and VHF spectrum, and would ultimately be blamed. The resultant demands on the Commission would detract from other necessary Commission operations, and ultimately harm our Nation's defense.

III. CONCLUSION

For these reasons, I strongly urge the Commission to reject BPL as a new broadband service competitor. There are sufficient alternative, and better, sources for broadband transport available that do not cause damage to other important services. BPL will result in interference to licensed users, and a legion of dissatisfied consumers. Moreover, by relying on HF and VHF spectrum, particularly bands currently authorized for use in the Amateur Radio Service, BPL providers will cause harmful interference to Amateur Radio, and other licensed, communications, either directly or by increasing the ambient noise levels in the HF spectrum. Such detrimental consequences will seriously undermine the ability of Amateur Radio to fulfill its mandate under the Communications Act as a national volunteer emergency communications resource. That consequence cannot be permitted to unfold.

I urge the Commission to resolve the future of BPL by terminating this proceeding with a finding that BPL is not technically compatible with existing services and would be detrimental to the public interest.

Respectfully submitted,

James A. Sanford, PE